SPC3000 Series
Particle Counters
User's Manual

Version 2.0

Products by Setra Systems, Inc. - SPC3000 Series

NOTICE: The contents of this manual are subject to change without notice.

Product Name: Setra Systems. Inc. SPC3000 Series Remote Particle Counter
Model Numbers: SPC33014M3NWNNS, SPC33014M3PWNNS, SPC35014M3NWNNS, SPC35014M3PWNNS, SPC35102M3NWNNS, SPC35104M3NWNNS

The following standards are applied only to the particle counters that are so labeled. EMC is tested using Setra Systems power supplies.

North America: EMI: FCC/ICES-003 Class A

FCC Compliance Statement for American Users

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

Table of Contents

Contents

1-1 Overview

Thank you for purchasing a Setra Systems particle counter, the world's smallest, remote particle counter sensor available for measuring and monitoring particle counts in clean room and controlled environments for the Aerospace, Life Science, Data Storage, IAQ and Industrial Hygiene Markets.

This user manual will provide the detailed explanation and instructions for the proper use and operation of this feature-rich particle counter.

The Setra Systems particle counters provide a range of particle size measurement from 0.3 µm to 10.0 µm for both 0.1 and 1.0 CFM flow. These sensors allow for efficient particle counting with high accuracy and resolution that meets ISO 21501-4 for the calibration of a particle sensor.

These particle counters are configured with 2 or 4 particle size channel versions. The output of these sensors can be accessed through the use of external software, a PLC, SCADA or facility monitoring system that communicates via MODBUS ASCII or RTU protocols over an RS-485 connection.

Thank you,

1-2 Specifications

Size Channels: **SPC35102M3NWNNS**	Factory calibrated at 0.5 & 5.0 µm
Size Channels: **SPC35104M3NWNNS**	Factory calibrated at 0.5, 1.0, 2.5 & 5.0 µm
Size Range	0.5 to 5.0 µm
Flow rates	1.0 CFM (28.3 LPM)
Counting Efficiency	50% @ 0.5 µm; 100% for particles >0.75 µm per JIS

Size Channels: **SPC33014M3NWNNS**	Factory calibrated at 0.3, 0.5, 1.0, & 5.0 µm
Size Range	0.3 to 25 µm
Flow rates	0.1 CFM (2.83 LPM)
Counting Efficiency	50% @ 0.3 µm; 100% for particles >0.45 µm per JIS

Size Channels: **SPC35014M3NWNNS**	Factory calibrated at 0.5, 1.0, 2.5 & 5.0 µm
Size Range	0.5 to 25 µm
Flow rates	0.1 CFM (2.83 LPM)
Counting Efficiency	50% @ 0.5 µm; 100% for particles >0.75 µm per JIS

Size Channels: **SPC33014M3PWNNS**	Factory calibrated at 0.3, 0.5, 1.0, 2.5 & 5.0 µm
Size Range	0.3 to 25 µm
Flow rates	0.1 CFM (2.83 LPM)
Counting Efficiency	50% @ 0.3 µm; 100% for particles >0.45 µm per JIS

Size Channels: **SPC35014M3NWNNS**	Factory calibrated at 0.5, 1.0, 2.5 & 5.0 µm
Size Range	0.5 to 10 µm
Flow rates	0.1 CFM (2.83 LPM)
Counting Efficiency	50% @ 0.5 µm; 100% for particles >0.75 µm per JIS

Zero Count	<1 count / 5 minutes (<2 particles / ft³) (per ISO 21501-4 & JIS)
Calibration	NIST traceable
Vacuum Requirements	External vacuum >15” (38.1 cm) of Hg
Communication Modes	MODBUS™ RTU or ASCII outputs (specified upon order)
Connections	RS-485
LED Indicators	User-settable LED Ring Green: Solid or blinking based on Modbus register value Red: Solid or blinking based on Modbus register value Power LED Green: Solid = Power, Blinking = Counting Service LED Red: Off = No Faults, Blinking = Fault(s)
Standards	ISO 21501-4 and JIS B9921
Calibration	Recommended minimum once per year
External Surface	Stainless Steel
Dimensions (L x W x H)	1.85” x 3.58” x 3.37” (4.7 cm x 9.1 cm x 8.6 cm) Not including probes or connectors
Weight	1.07 lb. (0.485 kg)
Accessories	Wiring connector
Optional Accessories	Isokinetic probes, purge filter assembly
Power	9-24 VDC
Operating Conditions	41º to 104ºF (5º to 40ºC) / 20% to 95% non-condensing
Storage Conditions	32º to 122ºF (0º to 50ºC) / Up to 98% non-condensing
Warranty	2 Years. Extended warranties available.

Please note that specifications are subject to change without notice.

1-3 Included Accessories

Description	Part Number	Image
Wiring Connector	AS-99086	
3000 Series User Manual (USB Key - One per order)	MN-24028	

1-4 Optional Accessories

Description	Part Number	Image
Isoprobe 0.1 CFM (2.83 LPM) Stainless Steel	PS-12041	
Isoprobe 1.0 CFM (28.3 LPM) Stainless Steel	AT-2101	
Purge Filter Assembly 0.1 CFM (2.83 LPM)	AS-99002A	
Purge Filter Assembly 1.0 CFM (28.3 LPM)	AS-99041A	

1-5 Product Views

2-1 Unpacking and inspecting the Instrument

Careful consideration was given to our packing material to ensure that your Setra Systems Instrument will reach you in perfect condition. If the Instrument has been subject to excessive handling during shipping, there may be visible damage to the shipping carton. In the event of damage, keep the shipping container and packing material for the carrier's inspection. Carefully unpack the Instrument from its shipping container and inspect the contents for damaged or missing items. If the Unit appears damaged or something is missing, contact the carrier and Setra Systems immediately. Please save the container and packing material in case you must return the Instrument.

2-2 Registering Your Product

All Setra Systems Instruments are automatically registered upon sale for the warranty period and tracked by Serial number.

2-3 Contacting Setra Systems

To order accessories, receive technical assistance, report damaged or missing items from your shipment, or get contact information for your nearest Setra Systems authorized reseller, call **+1-800-257-3872 or +1-978-264-0292**

2-4 Storing and Shipping the Instrument

If the unit needs to be packed and shipped for annual calibration or service, it is recommended to use the original packing materials. If they are not available, please insure that the instrument is packaged in a box that is sturdy and that the unit is well protected with proper packing materials to cushion and protect it from harm during transit.

To store the instrument, place it in a box, under cover, in an environment as stated in our specifications.

2-5 Power Considerations and Connecting to AC Power

The Setra Systems 3000 Series Instrument is powered from a customer provided external DC power source between 9 – 24 VDC.

2-6 Turning the Unit On

The 3000 Series instruments are designed to operate as fixed installed instruments, and automatically power on when power is applied to the external power connector. The instrument can be powered down if the power connection is removed.

2-7 Laser Safety Information

The Remote Particle Sensor is a Class 1 laser-based instrument.

•During normal operation, you will not be exposed to laser radiation.

•Precaution should be taken to avoid exposure to hazardous radiation in the form of intense, focused, invisible light.

•Exposure to this light may cause blindness.

Take these precautions:

•**DO NOT** remove any parts from the particle sensor unless you are specifically told to do so in this manual.

•**DO NOT** remove the housing or covers. There are no user-serviceable components inside the housing.

DANGER

◆ **Any use of controls, adjustments, or procedures other than those** spec**ified in this manual may result in exposure to hazardous optical radiation.**

WARNING

2-8 Electrostatic Safety Information

Please complete all service and maintenance work at a static-safe work station. If you fail to do so, electrostatic discharge (ESD) may result in damaging electronic components. Please consider the following for creating a static-safe work station:

• Make sure all the test instruments are earth-grounded.

•Use a resistor-isolated wrist strap as well as a grounded conductive table mat.

3-1 Interpreting Indicators

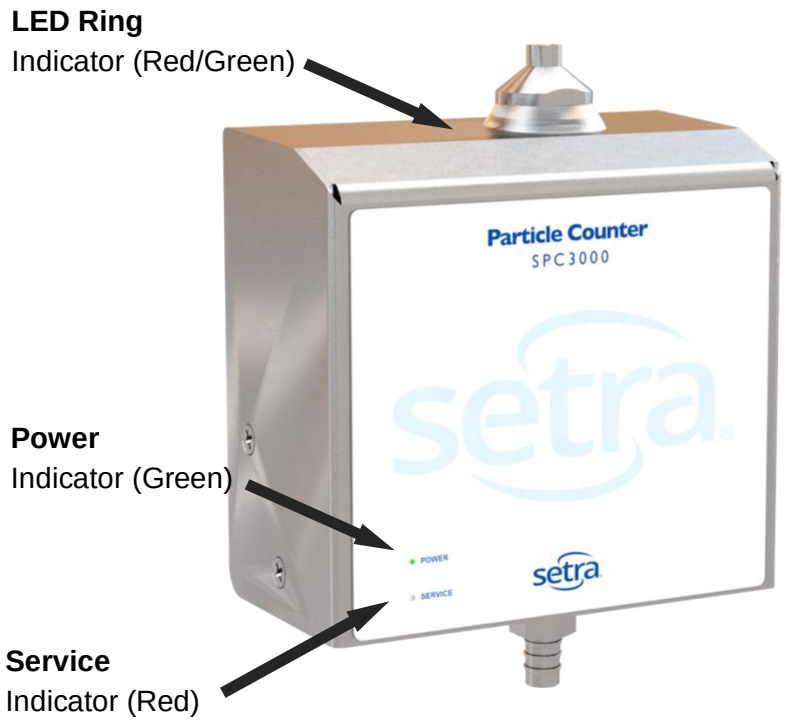

Figure 3-1 Front Panel LEDs

LED Indicators	**User-settable LED Ring** Green: Solid or blinking based on Modbus register value Red: Solid or blinking based on Modbus register value **Power LED** Green: Solid = Power, Blinking = Counting **Service LED** Red: Off = No Faults, Blinking = Fault(s)

3-2 Connections

Figure 3-2 Connections on Top of Instrument (inlet)

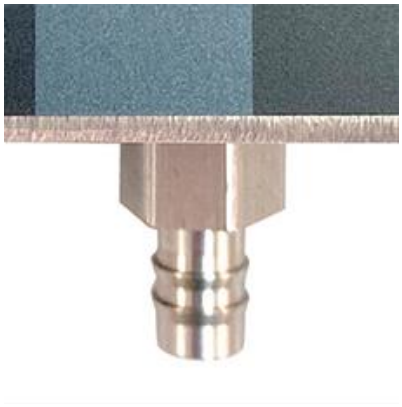

Figure 3-3 Connections on Bottom Right of Instrument (vacuum connection)

3-3 Installation

Please follow the steps below to prepare the instrument.

1. Locate where instrument(s) are going to be mounted.
2. Attach the Optional Isokinetic Inlet Joint Tube to the top of the inlet.

Figure 3-5 Attach Optional Isokinetic Inlet to Joint Tube

3. Attach the Optional Isokinetic Inlet to Joint Tube.

Figure 3-6 Attach Optional Isokinetic Inlet to Joint Tube to Inlet

4. Please refer to section 3.4 and 3.5 for communication and wiring details.
5. Attached the sensor to an external vacuum pump system with a tube at the bottom of the instrument. Add a negative pressure gauge to the other end of the tube. If the pressure is more than -15 in.Hg (-50kPa) vacuum. The flow rate of a 3000 series is controlled to maintain proper flow (There is a critical orifice inside of the unit, which controls the flow rate when the negative pressure is equal to our greater than -15 in. Hg (-50kPa) vacuum. After checking the negative pressure, remove the negative pressure gauge, and then attach the tube to the outlet on the bottom of the sensor.

There is flow sensor in the unit. When the flow value is below the target threshold (e.g. the tube is bent, vacuum pump is not functioning, etc.), the sensor status register during sampling (see Modbus register map) will indicate a flow error. The Modbus Last record flow rate register (see Modbus register map) can be used to monitor flow rate.

3-4 Data Port

The connector on the bottom of the instrument is used to communicate with your facility monitoring system, Cleanroom Monitoring System, SCADA, or PLC.

Table 3-4 Connector Pin-outs

Connector	Signals
1	VIN (9-24vdc)
2	GND
4	Isolated GND
5	485B
6	485A

3-5 Single Sensor Installation

Figure 3-6 illustrates how to wire the connector for a whole system.

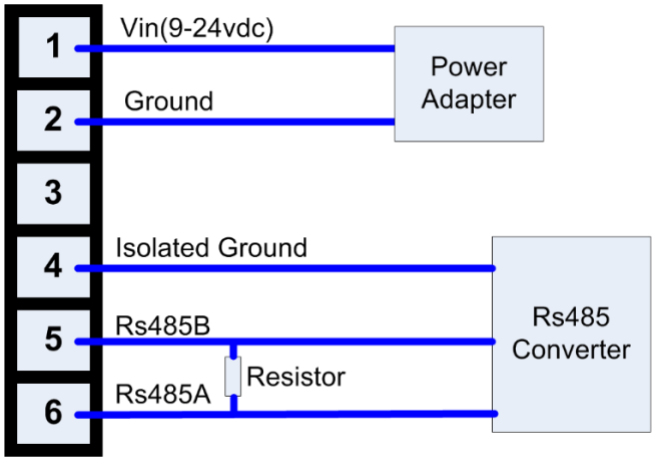

Figure 3-5 Application for a Single Sensor

3-6 Multiple Sensor Installation

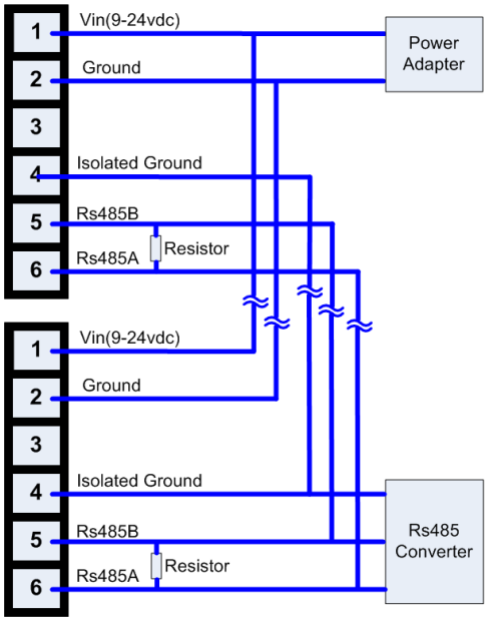

Figure 3-6 Typical Multiple Sensor Installation Diagram

In a multiple instrument configuration, the wires should be connected from adjacent instruments at the terminal block connector in order to create a bus and keep stub lengths to a minimum.

3-7 Cautions During Setup

1. Factory default address for the unit is 247. The default Baud Rate is 115200 bps, but the following baud rates are possible: 9600, 14400, 57600 bps. Communication is 8 data bits, at least 1 stop bit and no parity. The default Modbus protocol is Modbus-RTU.

2. The length of optional sampling tubing can have a length of up to 1 meter with an inside diameter of 5 or 6 mm. If longer or thinner tubing is used it could create head loss and reduce the flow rate. Please select the tube made of antistatic materials and deploy as straight as possible.

4-1 Communication Protocol

The remote particle sensor can be communicated with using the Modbus-RTU or Modbus- ASCII protocol. Facility/Cleanroom Monitoring software can be used as the monitoring system. If you would like to use your own monitoring system, please contact Setra Systems, Inc.

5-1 Maintenance/Calibration

- Please do not open the enclosure of the unit. If you need to open the enclosure, please contact Setra Systems for consultation.
- ISO 21501-4 states that the recommended calibration interval of an LSAPC (light scattering airborne particle counter) is one year or less. For calibration, please contact Setra Systems or an authorized distributor.
- Please check the negative pressure at the tube (where it connects to the outlet of the unit) to ensure that the vacuum pump is providing enough negative pressure to the unit.
  See Section 3.3, line 5 for more details.
- Before cleaning / disinfecting the environment, please turn off the unit, stop the vacuum pump, and then put the included red cap on the inlet nozzle.

For cleaning (fumigation) please be sure to follow this procedure:

[Before fumigation]

1. Turn off the Power of the unit.
2. Turn off the vacuum pump.
3. Put the red inlet cap on the isokinetic probe to protect the optical block from the agent.

[After fumigation]

4. Please make sure the air ventilation is completed (If agent is left in the environment and gets into the optical block, it will cause a malfunction).
5. Turn on vacuum pump and power.

Appendix - A

The MODBUS Register Map can be found on the USB memory stick as a separate PDF document file

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